Competency 5.5 **Personnel shall demonstrate a knowledge of industrial hygiene principles.**

1. Supporting Knowledge and Skills

a. Using references, discuss the purpose of the following DOE Orders:
- 5480.1 Environmental, Safety, and Health Programs for DOE Operations
- 5480.9 Construction Safety and Health Program
- 5480.10 Contractor Industrial Hygiene Program
- 5480.11 Radiation Protection for Occupational Workers
- 5483.1 Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned-Contractor-Operated (GOCO) Facilities
- 3790.1 Federal Employee Occupational Safety and Health Program

b. Discuss the key elements of a Hazards Communication Program and the use of Material Safety Data Sheets (MSDS).

c. Define a carcinogen and provide examples of carcinogens.

d. Discuss the key elements of a Carcinogen Control Program including specifically carcinogenic chemicals and asbestos control.

e. Discuss the importance of facility sanitation and housekeeping programs.

f. Discuss the importance and types of equipment used for personnel protection and safety including:
- Eye protection
- Foot protection
- Ear protection
- Protective Clothing
- Head protection
- Respiratory protection

2. Recommended Reading

Review

- DOE Order 5480.1, *Environmental, Safety, and Health Programs for DOE Operations*.
- DOE Order 5480.9, *Construction Safety and Health Program*.
- DOE Order 5480.10, *Contractor Industrial Hygiene Program*.
- DOE Order 5480.11, *Radiation Protection for Occupational Workers*.
- DOE Order 5483.1, *Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned, Contractor-Operated Facilities*.
- DOE Order 3790.1, *Federal Employee Occupational Safety and Health Program*.
- DOE Order 440.1, *Worker Protection Management for DOE Federal and Contractor Employees*.
- DOE Notice 441.1, *Radiological Protection for DOE Activities*.

3. Summary

Industrial hygiene comprises the anticipation, recognition, evaluation, and control of exposure to chemical, physical, and biological agents in the work place.

In order to ensure the recognition of agents of interest, workplace surveillance through the performance of surveys, inspections, or other site visits is required. The assessment of exposure almost always involves the estimation of exposure or actual performance of sampling or monitoring employee exposure level with respect to allowable levels for the agent. The use of personal sampling as a means of determining employee risk and the establishment of safe allowable levels for harmful agents are two of the touchstones of industrial hygiene. In general, the nearer the employee to an operation, and the longer the participation in the operation, the higher will be the personal exposure, and, therefore, the more likely that the employee's exposure will exceed allowable levels.

When exposure assessments or sampling indicates that controls are needed in order to reduce employee exposure to an agent, the industrial hygienist may recommend a range of engineering controls such as mechanical ventilation, administrative controls such as employee training, or the use by employees of personal protective equipment.

Among the elements of a safety and health program required by law is the presence of Material Safety Data Sheets (MSDS) in each work place where a particular hazardous chemical is used. In work places not served by an industrial hygiene staff and program, the MSDS may be the principal source of information available to the employee regarding potential health effects and guidance for protective controls. When, however, the site has a comprehensive industrial hygiene program requiring the performance of workplace surveillance, exposure assessments, and recommendation for controls, the guidance provided or available upon request will probably provide much more realistic and appropriate information than will be contained in any collection of MSDS.

For most chemical substances, it is presumed that there exists a threshold or allowable limit to which a healthy employee may be exposed without causing serious or irreversible health effects. For carcinogens that act on the nucleus of a cell, a threshold may not exist, i.e., there may be no safe level and the possibility of illness may be directly proportional to the exposure level. For this reason, DOE requires that employee exposure to carcinogens, as the term is defined by certain organizations, receive special industrial hygiene review so as to ensure that exposure to these agents is reduced to a reasonable minimum.

4. Suggested Exercises

Please refer to Scenarios 1, 2, 5, and 9 in the Scenario section of this document.